From: Bryan Hager <bhager@mindspring.com>
To: "Harold Reheis" <harold_reheis@mail.dnr.state.ga.us>
Date: Fri, Sep 22, 2000 12:43 PM
Subject: Vehicle Registration Study

September 22, 2000

Harold Reheis, Director
Georgia Environmental Protection Division

Dear Harold,

I appreciate receiving the report "Vehicle Registration Records Analysis and Model Year Distribution" by the Air Quality Laboratory at Georgia Tech. I shared that report with my clean air associates. We appreciate the initiative the EPD has taken to update the vehicle registration information. We also recognize the emphasis the EPD placed on determining how the vehicle registration information could be kept current. This information is very important for accurate modeling of emissions from vehicles.

We have the highest regard for the quality of work by researchers at Georgia Tech. However, we do have some questions about the report. I have attached a preliminary analysis by our consultant, Resource Systems Group. On behalf of the clean air litigants I request that you provide answers to the questions raised by our consultant. If you would like a clarification of the questions please contact the consultant directly. We look forward to seeing your response.

Sincerely,
Bryan

CC: "Marlin Gottschalk" <marlin_gottschalk@mail.dnr.state.ga.us>, "Ron Methier" <ron_methier@mail.dnr.state.ga.us>, "Wesley Woolf" <wwoolf@selcga.org>, "Norm Marshall" <nmarshall@rsginc.COM>

RESOURCE SYSTEMS GROUP
INCORPORATED

22 September 2000

Bryan Hager
Sierra Club
1447 Peachtree St Suite 305
Atlanta, GA 30309

Dear Mr. Hager,

Thank you for forwarding to us the "Final Vehicle Registration Records Analysis and Model Year Distribution Report," prepared by the Georgia Institute of Technology (August 3, 2000). At your request, we reviewed the document and have several questions and comments.

1) The report analyzes approximately 3.5 million registration records to determine vehicle registration-age distributions (for each vehicle class, the distribution of registration model years). Vehicle classification was determined by decoding the VINS numbers of these registered vehicles. According to the report, the software that Georgia Tech used did not decode approximately 6.5 percent of the VINS numbers properly. As mentioned in the text, the primary reason for these errors is that there was no consistent method of encoding VINS numbers prior to 1986. As a result, the highest VINS decoding error rate occurs with these older vehicles. We would like to find out what was done with the 6.5 percent of the records that were not decodable. If these records were thrown out, a bias towards newer, and thus less-polluting, vehicles would be created in the database. If these records were not thrown out, how were these vehicles distributed into classes such that the resulting database did not show a bias?

2) The results of their analysis indicate a rise in light gasoline truck sales in recent years. We believe that this is due to a rise in SUV sales. However, "SUV" is not a category in the VINS fields. Are SUVs considered trucks or cars when VINS numbers are encoded?

3) Appendix A shows the SQL code used in their analysis. Under "Selection for Light Duty Gas and Diesel Cars," there is a line of code for each model year except 1996. Why was 1996 excluded?

4) On page 4, it reads, "This table was derived the MOBILE table and included all of the records that qualified under the "truck" definition (Figure 1). The following are truck tables derived tables from the All Trucks table." These sentences do not make sense. We would like clarification of what they mean.

5) On page 4, it is mentioned that Appendix B contains spreadsheets showing the frequency and fractional distributions for gasoline and diesel powered passenger cars. While Appendix B does show registration distributions for certain vehicle classes, the

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light-duty gas vehicles, light-duty diesel vehicles, and light duty gasoline trucks one categories show zero percent for each model year. That is, the results are missing for these vehicle categories.

6) The 3.5 million vehicle VINS database only contains 6,031 heavy duty diesel trucks. This is only 0.2% of the total registered vehicles, even though heavy duty diesel trucks probably represent 2% to 10% of the VMT on regional highways. The US EPA MOBILE User's Guide recognizes that this could happen. "EPA encourages and recommends the use of actual locality-specific calendar year 1990 registration distributions by age in the development of SIP emission inventories. One exception to this would be areas having relatively few local HDDV registrations, but significant interstate trucking activity within the local area. Such areas may want to retain and use the MOBILE5 national registration distributions."[1] Given the poor representation of HDDV's in Georgia Tech's analysis, we recommend using national registration distributions.

7) In revising the MOBILE5B model inputs to accommodate 1999 vehicle registration distributions, the State must also update their VMT mix. Without doing so would bias the results towards lower emission rates. That is, Georgia Tech's analysis shows that there are greater numbers of SUVS being purchased as compared with 1990. Since SUV's have a greater emission rate than passenger cars, we would expect the vehicle fleet emission rate to increase. However, Georgia Tech's work only involves creating a vehicle age distribution *within* a vehicle class. It does not show the relative distribution of vehicle classes on the highways. As a result, by only updating the MOBILE5 inputs to reflect newer vehicles on the road in 1999, without also acknowledging that those newer vehicles are also more polluting (ie are LDGT rather than LDGV), biases the resulting MOBILE5 outputs towards lower-than-actual fleet emissions.

Please phone me with your suggestions on how to proceed further with our review,

Sincerely,
Resource Systems Group, Inc.

Kenneth Kaliski
Area Director

[1] Section 2.2.3.6, "User's Guide to Mobile5," US EPA

December 1, 2000

MEMO

TO: Marlin Gottshalk
Air Protection Branch, EPD-GDNR

CC: Michael Rodgers, Air Quality Laboratory, GT
Thomas Malecki, Air Quality Laboratory, GT
Kent Pierce, Air Protection Branch, EPD-GDNR

FROM: Leisha DeHart-Davis, Air Quality Laboratory, GT

RE: Response to Comments on Vehicle Registration Records Analysis

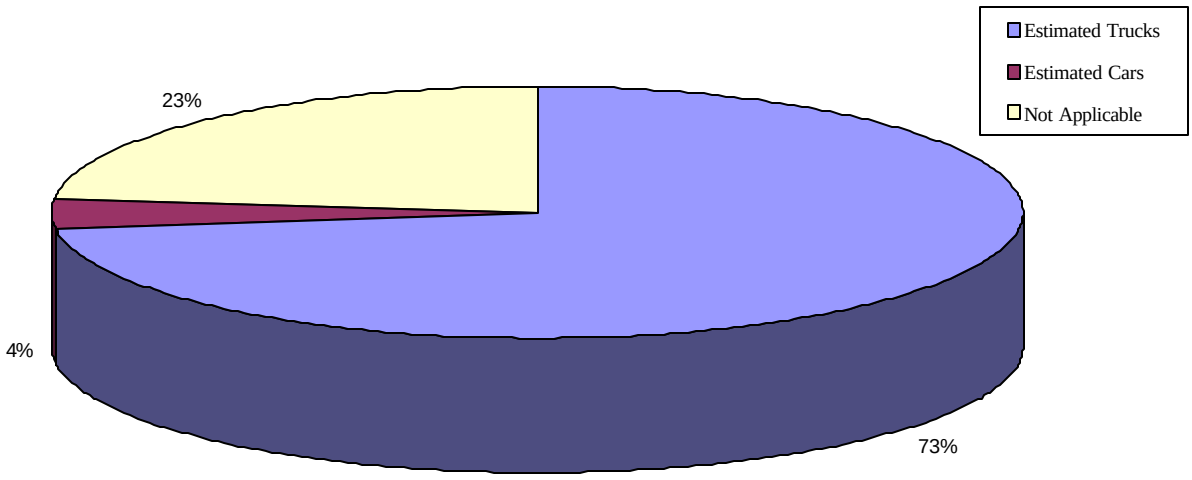
Thank you for the opportunity to respond to questions on the approach of Georgia Tech's Air Quality Laboratory in developing model year distributions for inputs into MOBILE5b. The September 22nd memo from Resource Systems Group raises seven issues, five of which are addressed in this memo. The last two issues, which address heavy-duty vehicle distributions and updating the vehicle miles traveled (VMT) mix used for MOBILE5b modeling, fall beyond the scope of our assigned task.

The first question asks the fate of the 6.5 percent of all vehicles with vehicle identification numbers that decoded improperly. You may recall from the report that we decoded 17-character vehicle identification numbers (VIN) to generate vehicle type and vehicle weight information. This information was then combined with fuel and model year from the registration data to categorize vehicles (LDGV, LDGT1, etc.). The percentage 6.5 is somewhat misleading in that many vehicles with VIN errors were retained and used in the model year distributions. For example, a vehicle may decode with errors in several fields, but include information on vehicle type and fuel that enable it to be categorized.

A figure more relevant to the concerns raised by the reviewer is the 213,180 vehicles for which the VIN decoder failed to provide the necessary information. To address concerns that excluding these vehicles may have biased the model year distributions towards a younger fleet, AQL re-examined VIN-decoding for the 213,180 excluded vehicles. Our efforts focused on a field titled "Series," which provides vehicle model information.

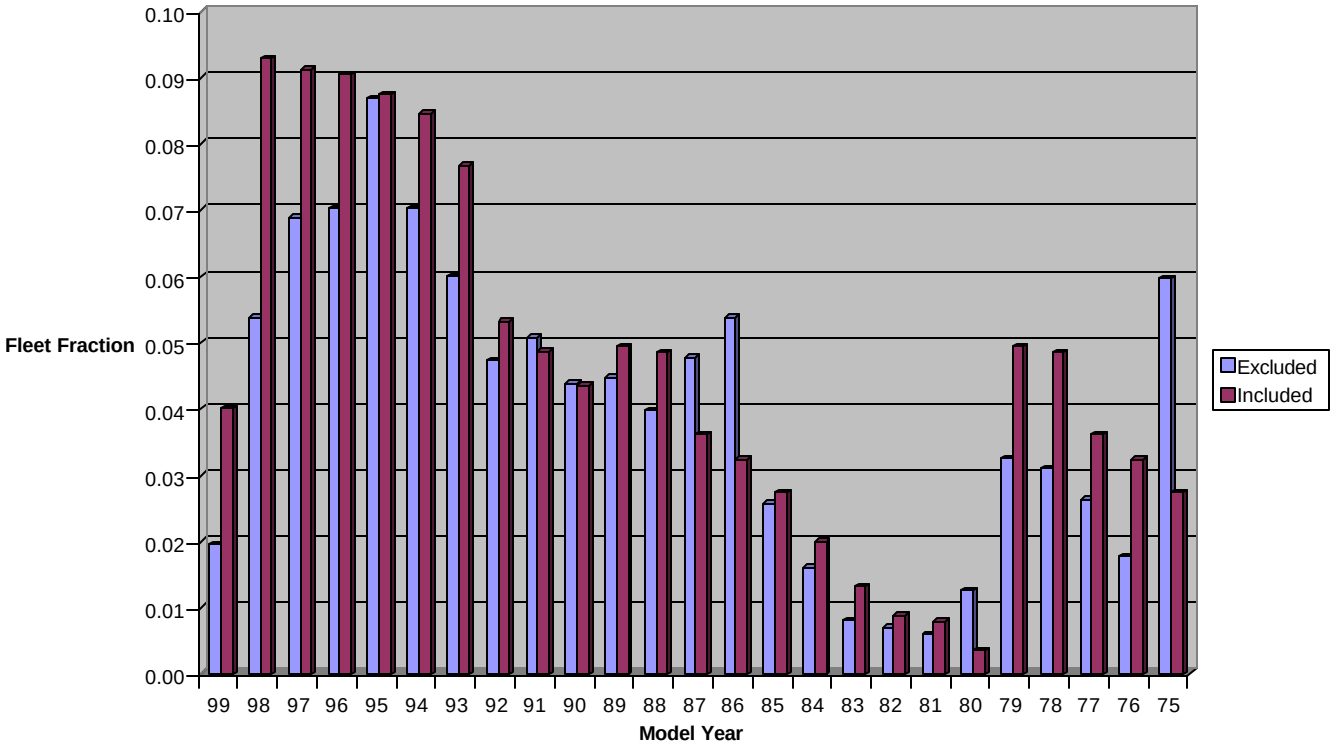
Because examining nearly a quarter-million records would be prohibitive in time and labor, we drew a random sample of 6330 records and ran frequency distributions on "Series" (Figure 1) Of these 6,330 records, 23 percent (1,483) provide no information that would enable vehicle categorization or provide information that exempt them from an emission inventory (e.g., trailers, electric vehicles). Seventy-three percent appear to be trucks (4,602) and four percent (244) appear to be cars. The word "appear" is deliberate, as we are *assuming* vehicle type based on the series description. In some cases the assumption appears valid, as is the case with sports-utility vehicles such as Land Cruisers. Furthermore, the absence of weight information makes it difficult to ascertain whether a truck is heavy-duty or light-duty.

Figure 1. Distribution of Excluded Vehicles
From Georgia Tech Vehicle Registration Analysis



Assuming for the moment that the excluded trucks are indeed light-duty, we compare their model year distributions with that of *included* light-duty trucks (Figure 2). The comparison indicates similar distributions, with a few notable differences. The excluded vehicles feature a slightly higher percentage of 1975 and older vehicles (six percent versus three percent), while the included fleet contains a higher proportion of 1976 to 1979 model years. The included fleet is more concentrated among 1993 and newer vehicles, whereas the excluded fleet contains a higher proportion of 1986-1987 model years. On the whole, the included fleet appears to be somewhat newer than the excluded one, with an estimated bias that is not as pronounced as originally predicted.

Figure 2. Excluded Versus Included Light-Duty Trucks



The second question addresses the vehicle classification for sport utility vehicles (SUVs). AQL categorizes as "trucks" those vehicles that decode as TRK (trucks), MPV (multi-purpose vehicles), BUS (buses), INC (incomplete), and VAN (vans). Gross vehicle weight and fuel are then used to determine the truck category in which to place the vehicle (e.g., LDGT1, HDGV, etc.)

In response to this question, we identified the top 49 selling sports utility vehicles for the year (http://carport.msn.com) and queried the VIN-decoded registration records for their vehicle type (Table I). Of the 49 vehicles, six have VINS that do not decode (n=1892) and five are not present in the registration database. Of the remaining 38 vehicles, five decode as cars and 33 decode into categories that ultimately classify them as trucks.

The reviewer asks why the line of code for 1996 vehicles is missing in the appendix. This is a typo that occurred while copying and pasting from the original code to the appendix. Thus, the original code contained a line for 1996 light-duty gasoline and diesel cars.

The fourth question asks for clarification of report text. The sentences in question are best described in the following way. AQL generated a master table containing all information needed to categorize vehicles. The table, named in the report as "Mobile", includes fuel and model year from the registration data and vehicle type and gross vehicle weight from VIN decoding. We queried this master table using criteria for identifying different truck types and created a sub-table labeled "All Trucks." While not the subject of the reviewer's question, this process was repeated to create an "All Cars" table as well.

The final question asks why the distributions for light-duty gasoline vehicles, light-duty diesel vehicles, and light-duty gasoline trucks contained all zero values. These individual vehicle distributions were combined with other distributions, as required by the MOBILE5b model. Thus light-duty gasoline vehicles are combined with light-duty diesel vehicles. Similarly, light-duty gasoline trucks I are combined with light-duty diesel trucks. We included empty distributions for consistency and to call attention to the fact that these individual distributions were combined for modeling purposes.

Table I. Comparison of Select Model Years, Excluded Versus Included Light-Duty Trucks

Model Year	Included Fleet Fraction (Avg)	Excluded Fleet Fraction(Avg)
1975 and Older	0.03	0.06
1976-1979	0.04	0.03
1986-1987	0.03	0.05
1993 and Newer	0.08	0.06

Table IIA. Sports Utility Vehicles and Vehicle Type*

No.	SUV	Make	VIN Vehicle Type	Explanation
1	Hummer	AM General	MPV	
2	XS	BMW	TRK	
3	Escalade	Cadillac		Does Not Decode
4	Blazer	Chevrolet	TRK	
5	Surburban	Chevrolet	TRK	
6	Tahoe	Chevrolet	TRK	
7	Tracker	Chevrolet		Does Not Decode
8	Durango	Dodge	MPV	
9	Escape	Ford	INC	
10	Excursion	Ford		Not In Registration Database
11	Expedition	Ford	VAN	
12	Explorer	Ford	VAN	
13	Explorer Sport Tr	Ford	VAN	
14	Envoy	GMC	MPV	
15	Jimmy	GMC	TRK	
16	Yukon	GMC	MPV	
17	Yukon Denali	GMC	MPV	
18	Yukon XL	GMC	MPV	
19	CR-V	Honda		Does Not Decode
20	Passport	Honda		Does Not Decode
21	QX4	Infiniti	CAR	
22	Amigo	Isuzu	MPV	
23	Rodeo	Isuzu	MPV	
24	Trooper	Isuzu	TRK	
25	Vehicross	Isuzu		Does Not Decode

*This list representing top-selling sport utility vehicles was identified through the Microsoft News Network site at http://carport.msn.com, a page which MSN no longer supports.

Table IIB. Sports Utility Vehicles and Vehicle Type

26	Cherokee	Jeep	MPV	
27	Grand Cherokee	Jeep	MPV	
28	Wrangler	Jeep	MPV	
29	Sportage	Kia	CAR	
30	Discovery	Land Rover	MPV	
31	Range Rover	Land Rover	MPV	
32	LX 470	Lexus	CAR	
33	RX 300	Lexus	CAR	
34	Navigator	Lincoln		Does Not Decode
35	Tribute	Mazda	MPV	
36	M-Class	Mercedes-Benz		Not In Registration Database
37	Mountaineer	Mercury		Not In Registration Database
38	Montero	Mitsubishi	MPV	
39	Montero	Mitsubishi	MPV	
40	Pathfinder	Nissan	MPV	
41	Xterra	Nissan		Not In Registration Database
42	Bravada	Oldsmobile	BUS	
43	Aztec	Pontiac		Not In Registration Database
44	Forester	Subaru	CAR	
45	Vitara	Suzuki	MPV	
46	Grand Vitara	Suzuki	MPV	
47	4-Runner	Toyota	MPV	
48	Land Cruiser	Toyota	MPV	
49	Rav4	Toyota	MPV	

*This list representing top-selling sport utility vehicles was identified through the Microsoft News Network site at http://carport.msn.com, a page which MSN no longer supports.